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Evaluating COVID-19 Vaccine Effectiveness: A Retrospective Test-negative Case-control Study across Pre-omicron and Omicron Periods

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Introduction

The emergence of the Omicron variant of SARS-CoV-2 marked a significant shift in the COVID-19 pandemic, influencing transmission dynamics and vaccine effectiveness. Understanding how vaccines performed before and after Omicron's dominance is crucial for informing public health strategies and vaccination policies. This article delves into a retrospective test-negative case-control study conducted in Turin, Italy, assessing the effectiveness of both original and bivalent COVID-19 vaccines during the pre-Omicron and Omicron periods. The COVID-19 pandemic has had an unprecedented impact on global health, prompting rapid vaccine development to curb its spread. As of early 2021, several vaccines, including mRNA-based and viral vector vaccines, received emergency use authorizations. With the emergence of various SARS-CoV-2 variants, including the Omicron variant, the ongoing evaluation of vaccine effectiveness remains crucial to understand how vaccines perform across different periods and in the face of evolving viral strains [1,2].

Description

The study highlights a significant reduction in vaccine effectiveness against both hospitalizations and ICU admissions during the Omicron period compared to the pre-Omicron era. However, administering booster doses, particularly the updated bivalent vaccines, substantially enhanced protection. These findings emphasize the necessity for ongoing vaccination efforts, including booster shots, to mitigate the impact of emerging variants like Omicron. It's essential to recognize that vaccine effectiveness can vary based on factors such as age, time since vaccination, and the specific SARS-CoV-2 variant in circulation. Continuous monitoring and adaptation of vaccination strategies are crucial to address the evolving nature of the pandemic and to maintain robust protection against COVID-19. In the pre-Omicron period, COVID-19 vaccines, particularly those based on mRNA technology and viral vectors (e.g., AstraZeneca), demonstrated substantial effectiveness in preventing severe illness, hospitalization, and death.

Early studies showed that these vaccines were highly effective against the original strain of SARS-CoV-2, as well as some of its early variants like Alpha and Delta. Evaluating COVID-19 vaccine effectiveness through retrospective test-negative case-control studies provides valuable insights into the real-world performance of vaccines across different periods of the pandemic. While vaccines demonstrated high effectiveness in preventing severe outcomes during the pre-Omicron period, the emergence of the Omicron variant highlighted the need for booster doses to maintain protection against symptomatic infection. These findings emphasize the dynamic nature of vaccine strategy and the importance of adapting to new challenges as the virus continues to evolve. As the global vaccination campaign continues, it is clear that ongoing research and data collection will be critical in shaping the future of COVID-19 control efforts [3-5].

Conclusion

Researchers conducted a retrospective, test-negative, case-control study involving 5,768 adults aged 50 and above. These individuals were hospitalized with COVID-19-like illnesses in Turin's Health Unit network hospitals between January 2021 and January 2023. The effectiveness of COVID-19 vaccines has remained high in preventing severe disease, hospitalization, and death, both in the pre-Omicron and Omicron periods. However, the emergence of the Omicron variant highlighted the virus's ability to partially escape vaccine-induced immunity, leading to a reduction in protection against symptomatic infection. Nonetheless, booster doses have proven essential in restoring vaccine efficacy, especially in preventing severe outcomes. Retrospective test-negative case-control studies provide critical insights into the real-world performance of vaccines, underscoring the continued importance of vaccination, including booster doses, in the ongoing fight against COVID-19. Despite the reduced effectiveness in preventing infection, vaccines continued to offer strong protection against severe disease, hospitalization, and death caused by Omicron. Test-negative studies showed that the effectiveness of vaccines in preventing severe outcomes remained relatively high, particularly for individuals who received booster doses.

Acknowledgement

None.

Conflict of Interest

None.

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